Predictive Value of the Miami Emergency Neurologic Deficit (MEND) Exam for Detecting Large Vessel Occlusion Strokes

Ivette Motola1, Angel A. Brotons1, Richard D. Rodriguez1, Erika Marulanda-Londoño2, Steven Carter1, Hua Li3, S. Barry Issenberg1

1Gordon Center for Research in Medical Education, 2Department of Neurology, 3Department of Biostatistics, University of Miami Miller School of Medicine

Background

Recent developments in the care of ischemic stroke patients with large vessel occlusion (LVO) have highlighted the need to transport these patients to comprehensive stroke centers (CSC) with neurointerventional capabilities.

Methods

The Miami Emergency Neurologic Deficit (MEND) exam is a brief, practical, and effective screening tool for identifying stroke patients in the field.1

- It was developed in 1998 by a group of stroke neurologists, emergency physicians, neuroscience nurses and paramedics.
- The MEND exam contains the Cincinnati Prehospital Stroke Scale (CPSS), and additional components from the National Institutes of Health Stroke Scale (NIHSS) to detect both anterior and posterior circulation strokes.
- A previous study showed that the MEND exam performed by paramedics in the field highly correlated with the NIHSS performed by the stroke team on arrival to the hospital.2

MEND Exam

- Paramedics and flight nurses in Monroe County, FL were trained in the Advanced Stroke Life Support (ASLS®) Curriculum, which incorporates hands-on MEND exam training.
- Paramedics performed the MEND exam in the field on patients suspected of having a stroke.
- The patients were then airlifted directly from the scene in Monroe County, FL to Jackson Memorial Hospital, a comprehensive stroke center in Miami, FL.

Results

- Upon arrival, patients were evaluated by the Emergency Department (ED) physician and the Stroke Team, who performed an NIHSS.
- The investigators analyzed MEND exam findings conducted by paramedics on consecutive patients suspected of having stroke, and a convenience sample of additional emergency medical services (EMS) patients with various complaints.
- Hospital electronic health records were then reviewed to determine whether the patients had LVO, based on imaging results (CTA and MRA).
- If imaging was not available, two independent physicians, who were blinded to the MEND exam results, reviewed the medical records to determine whether the patient’s neurological findings were consistent with large vessel occlusion or not.
- LVO was defined as a total occlusion of the ICA, MCA-M1, MCA-M2, ACA-A1, ACA-A2, BA, VA, PCA-P1, or PCA-P2, consistent with other studies of endovascular therapy.
- Receiver operating characteristic curves, sensitivity, specificity, positive predictive value and negative predictive value were determined.
- Statistical analysis was conducted by biostatisticians at the University of Miami Miller School of Medicine using SAS, v.9.3.

Table 1: Accuracy of the MEND Exam for Diagnosis of Large Vessel Occlusion for various score cut-offs

<table>
<thead>
<tr>
<th>MEND SCORE</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥2</td>
<td>98%</td>
<td>10%</td>
<td>38%</td>
<td>89%</td>
</tr>
<tr>
<td>≥3</td>
<td>98%</td>
<td>29%</td>
<td>43%</td>
<td>96%</td>
</tr>
<tr>
<td>≥4</td>
<td>81%</td>
<td>51%</td>
<td>48%</td>
<td>83%</td>
</tr>
<tr>
<td>≥5</td>
<td>60%</td>
<td>65%</td>
<td>49%</td>
<td>74%</td>
</tr>
</tbody>
</table>

Conclusions

- The MEND is a simple and rapid evaluation that can be performed in the field by EMS personnel to screen for LVO strokes.
- In our study, a MEND score ≥3 identified 98% of LVOs, and a score ≥4 identified 81% of LVOs, with improved specificity.
- A cut-off of ≥3 captured the vast majority of LVO strokes.

References


Acknowledgements

We would like to thank all of the Monroe County Fire Rescue paramedics and flight nurses for their help with the study and for their tireless efforts in providing the best care possible to stroke patients.

The authors would like to acknowledge the funding support from the State of Florida Department of Education.

The study was approved by the University of Miami Institutional Review Board (001200270).